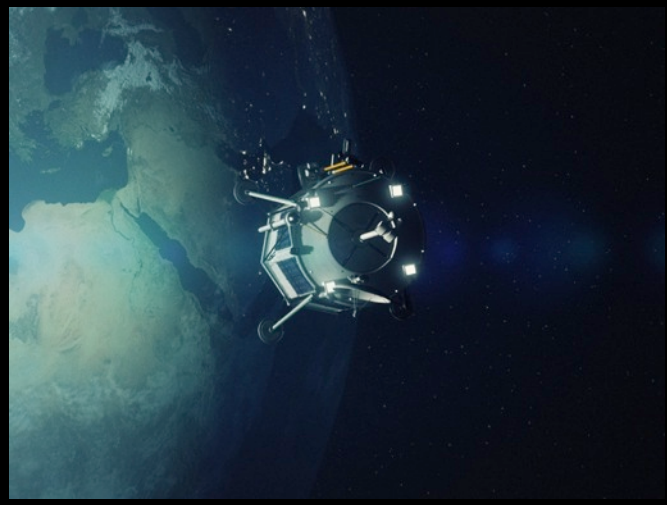
The Science Perspective

SSERVI Exploration Science Forum

NASA Ames, July 2015

Overview

- International robotic mission to the Moon's south pole ~2024
- Deep drilling for science
- Investigating a future manned base
- Billion year archive of life on Earth
- Mass participation, funding and inclusive education
- Preliminary crowdfunding successful



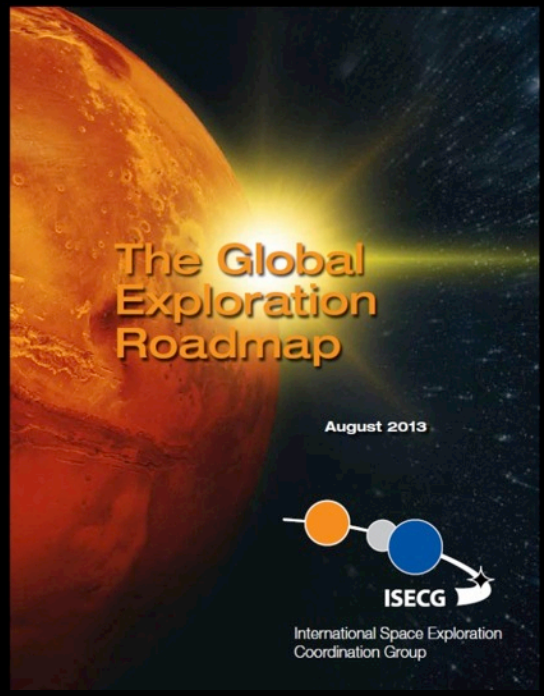
"By drilling we will unlock billions of years of geological history related to the origin and evolution of the Earth-Moon system."

Professor Ian Crawford, Department of Earth and Planetary Sciences, Birkbeck College, University of London

LUNAR MISSION ONE

Context – Global Exploration Roadmap

- New phase in exploration underway
  - Moon, Mars and beyond
  - Mix of robotic & manned
  - International collaboration is key
- Commercial investment and management
  - Launchers & spacecraft
  - Complements government programmes
  - New funding models
- Increasing involvement of citizens

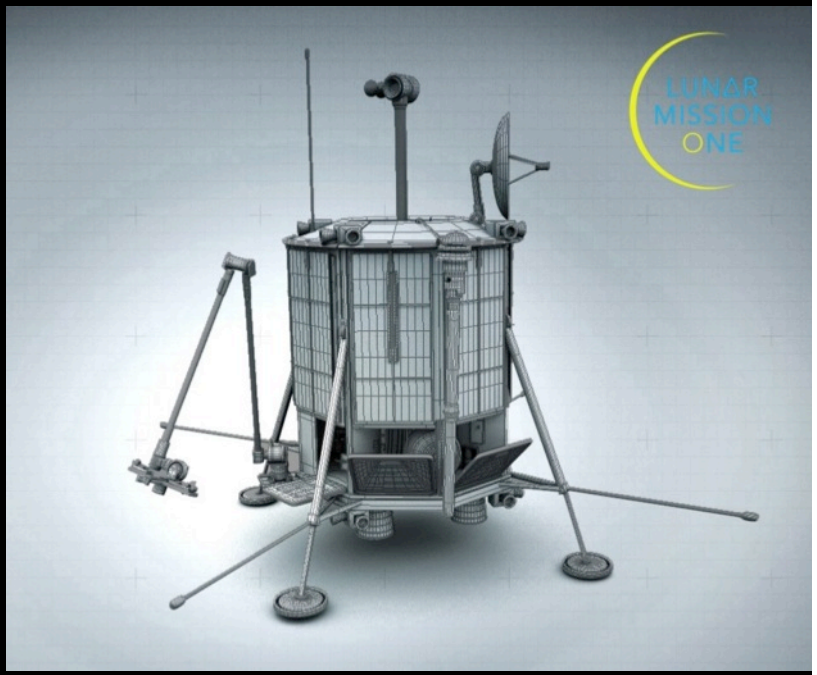


Lunar Mission One advances these trends

LUNAR MISSION ONE

Technology

- Precision landing
- Deep drilling using pioneering wire-line technology, 20-100m
- Remote control robotics
- Commercial international consortium, to be negotiated
  - Technology development
  - Mission operations
- Spin-out opportunities eg: safer drilling on earth



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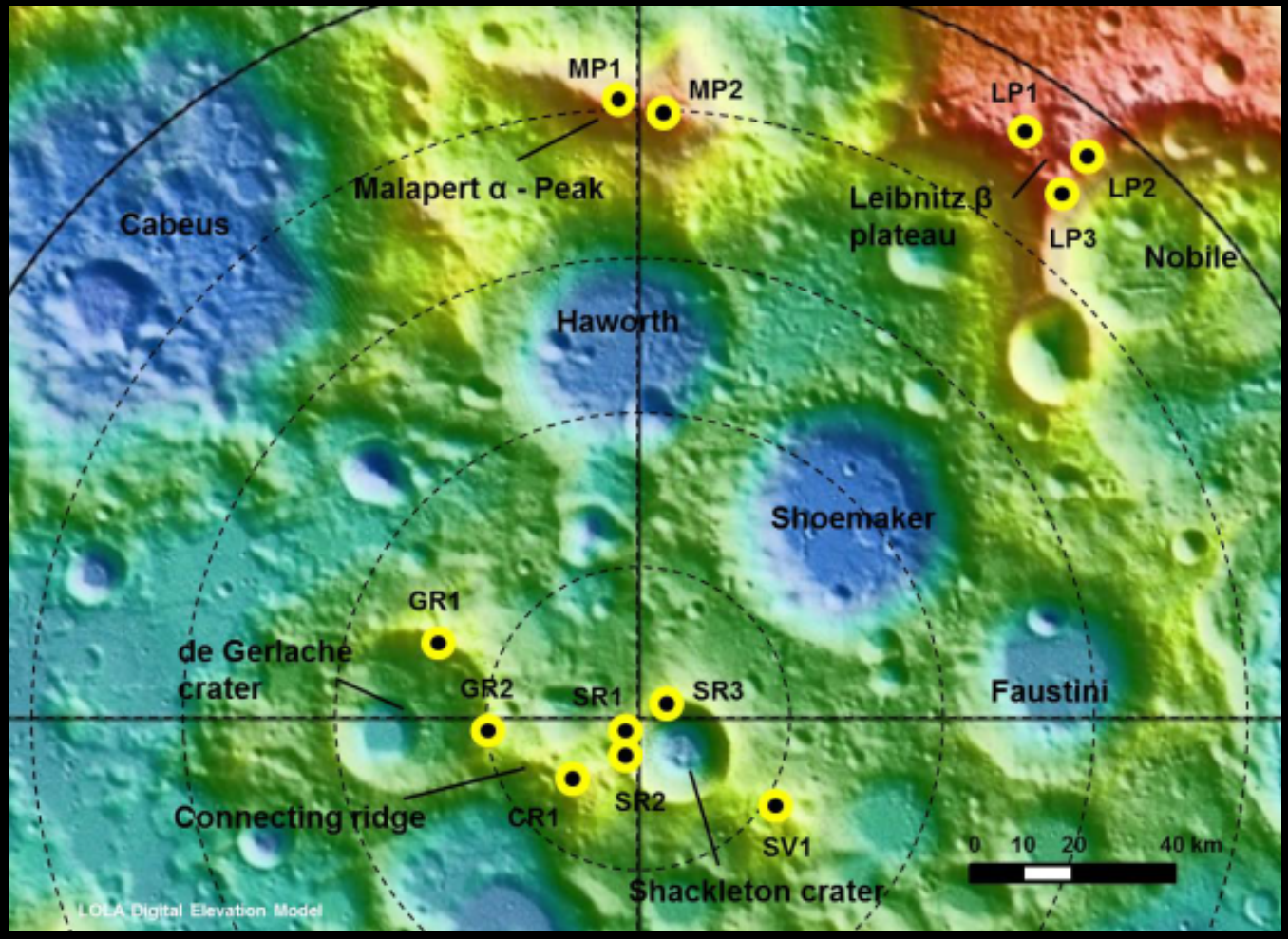
Landing Sites



NASA/LRO/LOLA

De Rosa, D., Bussey, B., Cahill, J.T., Lutz, T., Crawford, I.A., et al. *Planet. Space Sci.*, **74**, 224-246, (2012).

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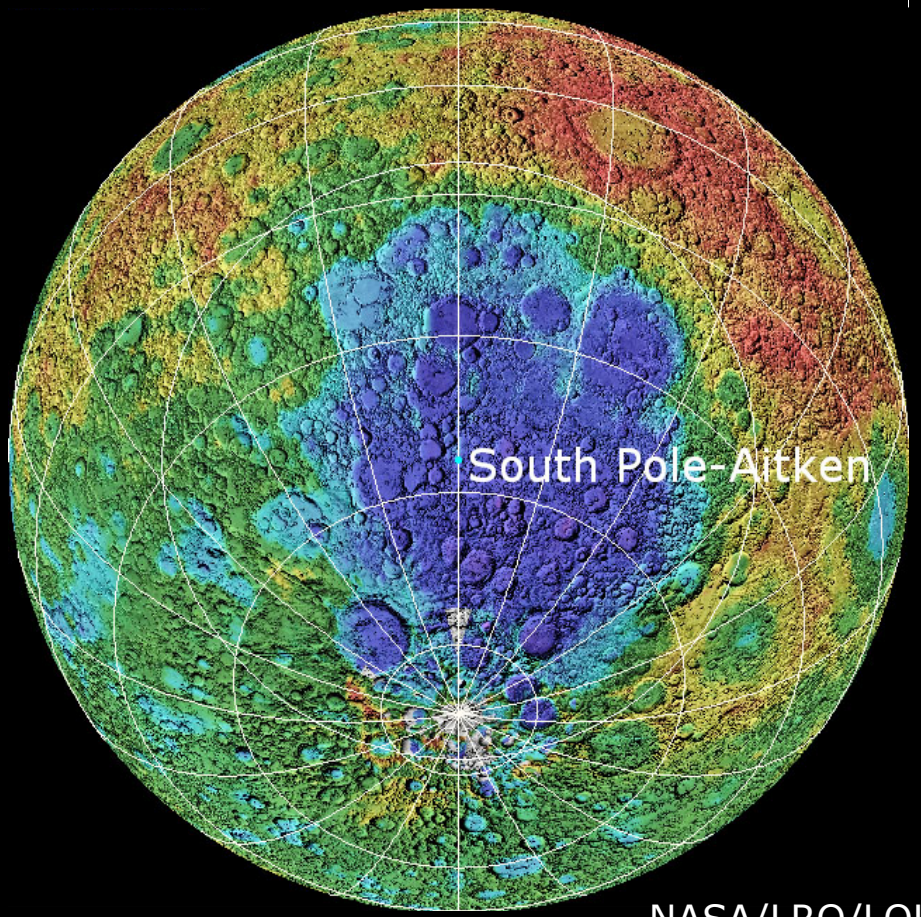
South Pole-Aitken Basin

- SPA will have exposed lower crustal and possible mantle material
- South pole lies just within the SPA
- Materials on the rim of Shackleton will likely sample this material.



NASA/LRO/LOLA

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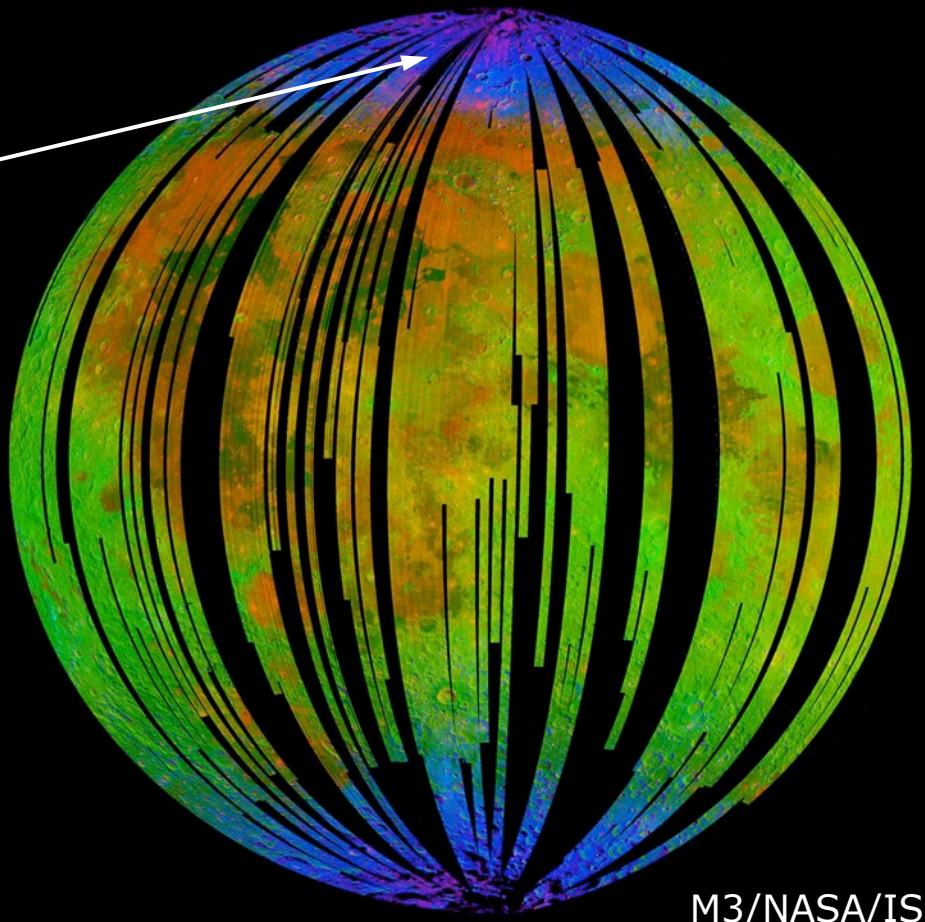
Polar Volatiles

- 3μm absorption band: surficial OH, H2O (≤800 ppm; C. Pieters et al., Science, 326, 568 2009)
- In situ measurements required to determine thickness and composition and origin of these volatiles



M3/NASA/ISRO

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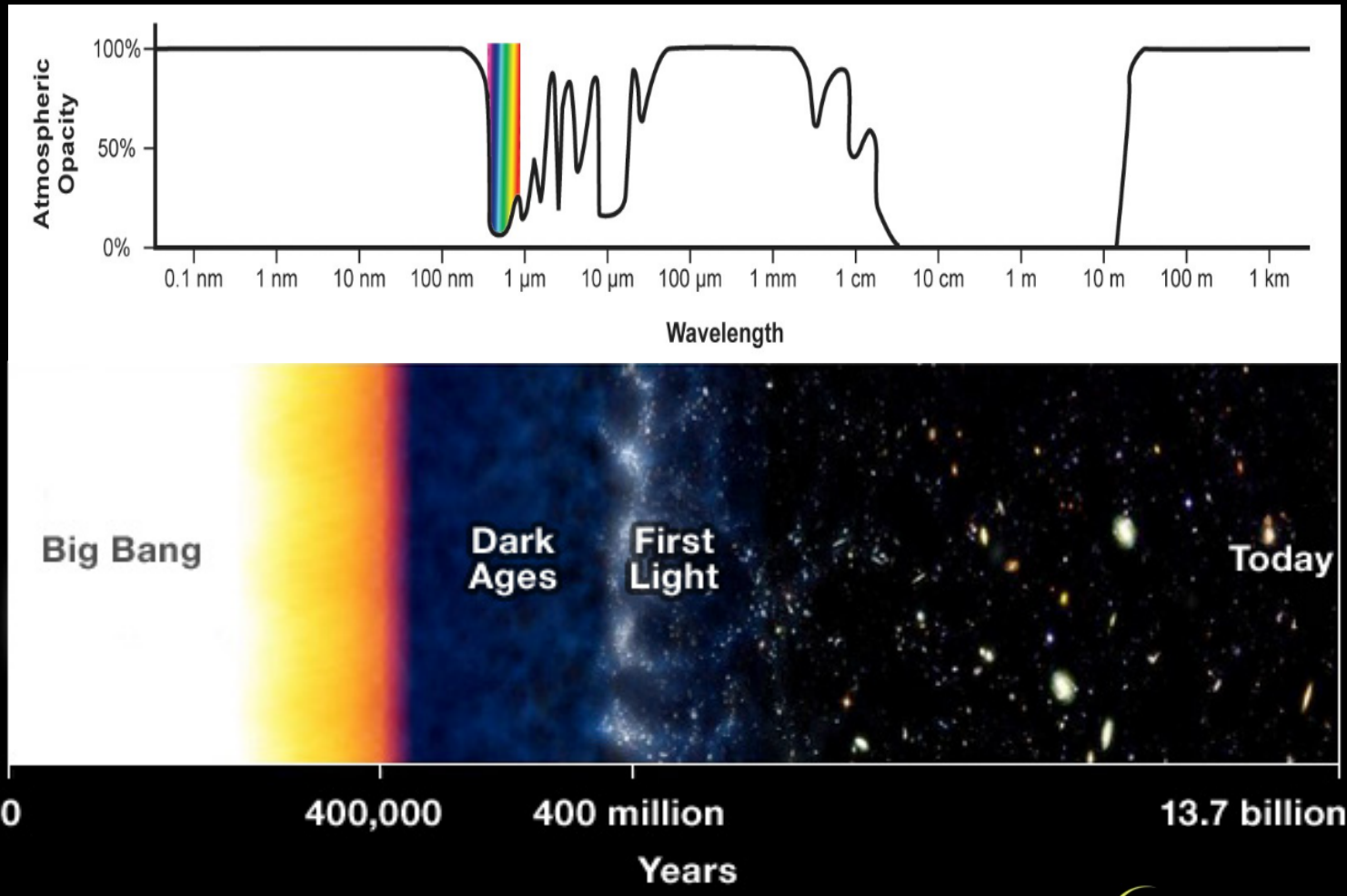
Radio Astronomy



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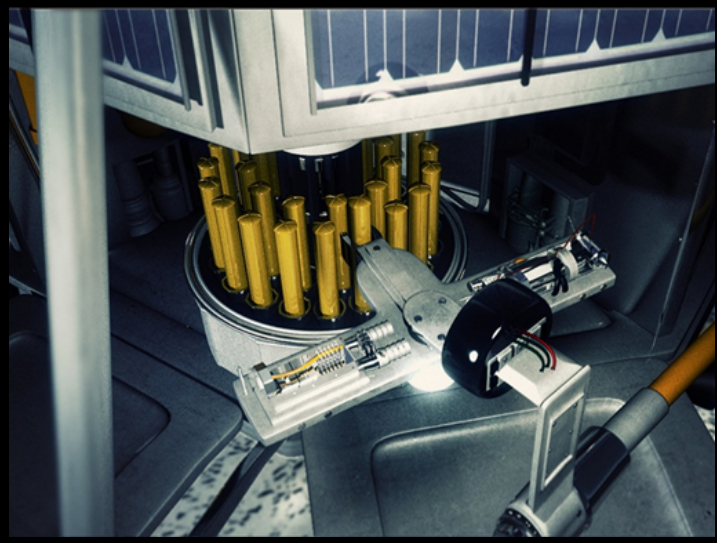
Archive & Education

- Comprehensive record of Life on Earth
  - Human history and civilisation
  - Database of biosphere/environment
- Private information and DNA code
  - Basis for project funding
- Billion year survival
  - Exceptional preservation conditions
- Schools, worldwide
  - Archive/culture, science, technology
  - All cultures, ages, abilities



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Private funding, public authority

- Private archive, consumers worldwide
  - Early reservations & club membership for enthusiasts
  - Later large scale global marketing, franchised local sales
  - $50-$500 typical, $1 low cost entry
- Revenue projection $ Billions
- Cost ~$1.5 Billion for space project and public engagement
- International Public Private Partnership
- All surplus to non-profit Trust for further space science & exploration

An enduring financial and educational legacy

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Programme

- 3 year procurement of main contracts – Setup Stage
  - Mission + revenues + instruments
  - In parallel: early revenues + pilot schools programme
- 6 year main development
  - Commercial mission management under government authority
  - Global sales & marketing campaign + education programme
- 6 months lunar operations
- On success, second mission for sample return

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Science Working Groups

- Science requirements
- Landing site selection
- Instruments
- Robotics
- Archive materials

Expecting significant international working, mainly US

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